ESCAN

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Abstract

The private and business jet market poses a challenging environment for providing cost competitive communication links replicating terrestrial systems. This is particularly evident with today's airborne cellular market and these issues will increase when addressing the need to disseminate high quality strategic aeronautical weather and environmental information in the next generation of business jet wireless infrastructure. While several techniques are being pursued, one tactic, driven by the high cost of hardware and maintenance for a satellite link, attempts to leverage the existing ground-based network. However, this highlights the difficult challenges to maintaining high quality of service for the ground and airborne user. A potential key towards addressing these issues is the advent of a cost competitive reconfigurable antenna. As an optimized link to the terrestrial infrastructure, the antenna fulfills multiple roles and has a great impact on the overall system capabilities. Honeywell is developing the ESCAN array, an 800 MHz – 2.6 GHz reconfigurable aperture derived from a ground-based satellite tracking design originally investigated by the Georgia Tech Research Institute under the DARPA sponsored RECAP program. This array is composed of multiple metallic patches connected by high performance embedded RF switches. The switches are controlled by a matrix of low-power lasers illuminating photovoltaic devices. The connectivity is dynamically altered over a specified area to maximize a particular radiation performance metric such as directive gain or broad bandwidth. The aperture has the ability to dynamically place nulls, steer beams with a single feed, generate single highly directional or multiple beams, and control bandwidth. It will provide optimal communication capability in changing environmental conditions. Aimed at applications demanding multi-functionality from a single aperture, ESCAN reduces the number of antennas required to support a platform and enables a rapid response in a changing communication infrastructure. Since ESCAN is designed specifically for cost sensitive airborne applications, Honeywell's proposed advances in the manufacture and electronic integration of these highly integrated apertures are a critical aspect of the program. From a larger perspective, this endeavor seeks to usher reconfigurable apertures into commercial markets by vastly improving manufacturability and cost compared to electronically scanned phased arrays.